

WHAT IS CLAIMED IS:

- 1 1. An alignment assembly enclosed within an optics module having a light
2 source and a lens comprising:
 - 3 an alignment stage coupled to enable adjustment of a relative
4 position of said light source and said lens, said alignment stage being
5 manipulable from an exterior of said optics module;
 - 6 a melttable material positioned within said optics module to lock
7 said alignment stage in a fixed location when a target said relative position of
8 said light source and lens is achieved; and
 - 9 a heat source in heat-transfer engagement with said melttable
10 material to selectively melt said melttable material.
- 1 2. The alignment assembly of claim 1 wherein said alignment stage is
2 responsive to first applied displacement forces which induce lateral move-
3 ments of said alignment stage in achieving said target relative position of said
4 light source and said lens, said alignment stage being responsive to second
5 applied displacement forces which induce said alignment stage to contact
6 said melttable material when said target relative position is achieved.
- 1 3. The alignment assembly of claim 2 wherein said second applied displace-
2 ment forces are electrostatic forces applied to said alignment stage to induce
3 displacement in a direction that is generally perpendicular to said lateral
4 movements induced by said first applied displacement forces.
- 1 4. The alignment assembly of claim 2 wherein said alignment stage includes
2 a metallic plating that is located such that said metallic plating contacts said
3 melttable material when said second applied displacement forces are
4 generated, said melttable material being a solder.

- 1 5. The alignment assembly of claim 4 wherein said solder is a gold/tin alloy.
- 1 6. The alignment assembly of claim 1 wherein said alignment stage, said
2 meltable material and said heat source are integrated components defined by
3 a plurality of layers on a substrate.
- 1 7. The alignment assembly of claim 6 wherein said substrate is a semicon-
2 ductor substrate and at least some of said layers have thicknesses of less
3 than 30 micrometers.
- 1 8. The alignment assembly of claim 1 wherein said alignment stage is
2 supported by thermally actuated members that provide said adjustment of
3 said relative position of said light source and said lens, said alignment stage
4 being responsive to electrostatic force to selectively displace said alignment
5 stage to contact said meltable material when said target relative position is
6 achieved.

1 9. An optics module comprising:

2 an enclosure;

3 a light source within said enclosure;

4 a lens positioned within said enclosure to optically manipulate a

5 beam generated by said light source;

6 an alignment assembly enabled to vary the relative positioning

7 between said lens and an axis of said beam, said alignment assembly being

8 located within said enclosure, said alignment assembly including support

9 members which are flexible to provide said varying relative positioning in a

10 direction generally perpendicular to said axis, said alignment assembly being

11 responsive to actuator forces to flex said support members;

12 a locking mechanism which disables said alignment assembly to

13 provide a fixed said relative positioning in which said alignment assembly is

14 unresponsive to said actuator forces; and

15 input/output connections at an exterior of said enclosure for

16 operating said alignment assembly and said locking mechanism.

1 10. The optics module of claim 9 wherein one of said light source and said

2 lens is fixed to said alignment assembly.

1 11. The optics module of claim 9 wherein said locking mechanism includes

2 (a) a heater, (b) a solder, and (c) a source of electrostatic force, said align-

3 ment assembly being responsive to said electrostatic force to move in a

4 direction generally aligned with said axis of said beam so as to bring said

5 alignment assembly into contact with said solder, said heater being located

6 and activated to selectively melt said solder.

1 12. The optics module of claim 9 wherein said locking mechanism includes a
2 connection for permanently fixing at least one of said support members in
3 position after a target condition of said relative positioning is achieved.

1 13. The optics module of claim 9 wherein said support members are thermal
2 actuators that vary said relative positioning in response to applications of
3 heat.

1 14. The optics module of claim 9 wherein said alignment assembly and said
2 heat source are defined by layers deposited on a semiconductor substrate.

1 15. A method of forming an alignment assembly for an optics module
2 comprising:

3 forming a plurality of patterned layers on at least one substrate
4 so as to define a cooperative assembly of:

5 (a) an alignment stage coupled to enable adjustment
6 of a relative position of a light source and a lens, said alignment stage
7 being configured to support one of said light source and said lens;

8 (b) meltable material positioned to lock said alignment
9 stage in a fixed location when a target said relative position of said light
10 source and said lens is achieved; and

11 (c) a heat source in heat-transfer engagement with
12 said meltable material to selectively melt said meltable material.

1 16. The method of claim 15 wherein forming said patterned layers includes
2 defining said meltable material as a solder.

1 17. The method of claim 16 wherein defining said meltable material includes
2 depositing a gold/tin alloy.

1 18. The method of claim 15 wherein forming said patterned layers includes
2 fabricating an actuator that is manipulated by applications of actuator signals.

1 19. The method of claim 18 wherein fabricating said actuator includes
2 forming said central region supported by flexible members.

1 20. A method of providing optical alignment within an optics module com-
2 prising:

3 applying actuator signals to laterally displace an alignment stage
4 which controls the relative lateral position of a beam axis to a lens, including
5 controlling said actuator signals to provide a target said relative lateral
6 position;

7 detecting when said target relative lateral position is achieved;
8 shifting said alignment stage in a direction generally parallel to
9 said beam axis to contact said alignment stage with a meltable material,
10 including melting said meltable material; and
11 cooling said meltable material to fix said alignment stage in a
12 position to maintain said target relative lateral position.

1 21. The method of claim 20 further comprising a fusible structure which
2 disables lateral movement of said alignment stage following said cooling step.

1 22. The method of claim 20 wherein applying said actuator signals is a step
2 of manipulating thermal actuators that support said alignment stage.

- 1 23. The method of claim 20 wherein melting said meltable material is a step
- 2 of applying heat to a gold/tin alloy.